

### REMARKS

Applicant requests favorable reconsideration and allowance of the subject application in view of the preceding amendments and the following remarks.

Claims 18-26, 29-31, 34 and 37-41 are presented for consideration. Claims 18, 26, 29-31 and 34 are independent. Claims 40 and 41 have been added to recite additional features of the subject invention. Support for these claims can be found in the original application, as filed. Therefore, no new matter has been added.

Applicant notes with appreciation that claims 26, 31, 34 and 39 have been allowed over the art of record, and that claim 23 would be allowed if rewritten in independent form. Applicant earnestly believes, however, that he should be entitled to the protection afforded by independent claim 23, as presented. Therefore, this claim has not been so rewritten at this time. Applicant further submits that new claims 40 and 41, depending from allowed claims 26 and 39, likewise should be deemed allowable at the outset. In addition to these claims being allowable, Applicant submits that independent claims 18, 29 and 30, for example, also patentably define features of the invention.

Applicant requests favorable reconsideration and withdrawal of the rejection set forth in the above-noted Office Action.

Claims 18-22, 24, 25, 29, 30, 37 and 38 were rejected under 35 U.S.C. § 103, as being unpatentable over U.S. Patent No. 6,211,944 to Shiraishi in view of U.S. Patent No. 5,659,429 to Kudo. Applicant submits that the cited art, whether taken individually or in combination, does

not teach or suggest many features of the present invention, as recited in claims 18-25, 29, 30, 37 and 38, as presented. Therefore, these rejections are respectfully traversed.

In one aspect of the present invention, independent claim 18 recites an illumination optical system for illuminating a surface, to be illuminated, with use of light from a light source. The illumination optical system includes a diffractive optical element for forming a desired light intensity distribution upon a predetermined plane, an angular distribution transforming unit for transforming an angular distribution of light incident or to be incident on the diffractive optical element into a plurality of predetermined distributions, a multiple beam producing unit, wherein the predetermined plane is a light entrance surface of the multiple beam producing unit, and a light projecting element for superposing light rays from the multiple beam producing unit one upon another on the surface to be illuminated.

In another aspect of the present invention independent claim 29 recites an exposure apparatus including an illumination optical system for illuminating a mask, to be illuminated, with use of light from a light source. The illumination optical system includes (i) a diffractive optical element for forming a desired light intensity distribution upon a predetermined plane, (ii) an angular distribution transforming unit for transforming an angular distribution of light incident or to be incident on said diffractive optical element into a plurality of predetermined distributions, (iii) a multiple beam producing unit, wherein the predetermined plane is a light entrance surface of the multiple beam producing unit, and (iv) a light projecting element for superposing light rays from the multiple beam producing unit upon one another on the surface to

be illuminated, and a projection optical system for projecting a pattern of the mask, illuminated with light from the illumination optical system, onto a wafer.

In a further aspect of the present invention independent claim 30 recites a device manufacturing method including the steps of applying a photosensitive material onto a wafer, and illuminating a mask surface, to be illuminated, by use of light from an illumination optical system. The illumination optical system includes (i) a diffractive optical element for forming a desired light intensity distribution upon a predetermined plane, (ii) an angular distribution transforming unit for transforming an angular distribution of light incident or to be incident on the diffractive optical element into a plurality of predetermined distributions, (iii) a multiple beam producing unit, wherein the predetermined plane is a light entrance surface of the multiple beam producing unit, and (iv) a light projecting element for superposing light rays from the multiple beam producing unit upon one another on the surface to be illuminated. The method further includes transferring, by use of a projection optical system, a pattern of the mask onto a wafer, and developing the transferred pattern.

Accordingly, in the present invention recited in these claims, the illumination optical system includes an angular distribution transforming unit which transforms an angular distribution of light incident on or to be incident on the diffractive optical element into a plurality of predetermined distributions. With this arrangement, the present invention assures a plurality of the formed illumination modes on the basis of a least number of diffractive optical elements. This is discussed in more detail on page 15, lines 11-20, of the subject specification.

Applicant submits that the cited art does not teach or suggest such features of the present invention, as recited in independent claims 18, 29 and 30.

In Applicant's view, the Shiraishi patent shows a projection exposure arrangement that has an illumination system and a projection system. The illumination system may include a plurality of optical integrators that form different secondary light sources. The illumination system includes a pattern with light from a secondary light source selected based on the pattern. The projection system projects an image of the pattern on a predetermined plane. The projection exposure apparatus may also include a light shielding device having a cross-like portion extending in first and second directions defined by the components of the pattern. The projection exposure apparatus may also include four off-axis secondary light sources wherein a ratio of a numerical aperture of a light beam from each of the four secondary light sources to a numerical aperture of the projection optical system is substantially 0.1 to 0.3.

As discussed above, in the present invention recited in independent claim 18, 29 and 30, an angular distribution transforming unit transforms the angular distribution of light incident or to be incident on the diffractive optical element into plural predetermined distributions. Advantageously, this feature permits changing the size of a light intensity distribution produced by a diffractive optical element. Regarding this feature, Applicant submits that the Shiraishi patent merely shows, in Figure 20, an exposure apparatus having a diffractive optical element 12. Applicant submits, however, that the Shiraishi patent does not at all teach or suggest the salient features of Applicant's present invention, as recited in independent claims 18, 29 and 30, which have been discussed above.

Applicant further submits that the remaining art cited does not cure the deficiencies noted above with respect to the Shiraishi patent.

The Kudo patent teaches an illuminating optical apparatus for performing, for example, oblique illumination. The apparatus has an arrangement in which an image of a reflecting mirror for reflecting a light beam from a light source is formed while being curved. In more detail, that patent teaches the use of interchangeable collimator lenses 3a and 3b to change the light intensity distribution of light incident on a fly's eye lens 4, between a distribution having a central void and a distribution without such a central void. This is discussed in more detail in the Kudo patent at column 10, lines 27-51. Applicant submits, however, that the Kudo patent does not teach or suggest the use of any diffractive optical element, in the manner of the present invention recited in independent claims 18, 29 and 30. Applicant submits, therefore, that the Kudo patent adds nothing to the teachings of the Shiraishi patent that would render obvious Applicant's present invention recited in these claims.

The Examiner asserts in the Office Action that the introduction of the collimator lenses 3a and 3b of the Kudo patent into the lens system 71 shown in Figure 20 of the Shiraishi patent would have been obvious to one having ordinary skill in the art. Applicant submits, however, that neither the Shiraishi patent nor the Kudo patent teaches or suggest the salient features of Applicant's present invention, as recited in independent claims 18, 29 and 30. Applicant submits, therefore, that there would be no incentive or motivation, absent Applicant's disclosure, to combine these citations in the manner set forth in the Office Action. Still further, Applicant

submits that even if the art were so combined, Applicant's present invention as recited in independent claims 18, 29 and 30, would not result.

For the reasons noted above, Applicant submits that the present invention, as recited in independent claims 18, 29 and 30, also is patentably defined over the cited art.

Dependent claims 19-25, 37 and 38 also should be deemed allowable, in their own right, for defining other patentable features of the present invention in addition to those recited in their respective independent claims. Further individual consideration of these dependent claims is requested.

Applicant further submits that the instant application is in condition for allowance. Favorable reconsideration, withdrawal of the rejection set forth in the above-noted Office Action and an early Notice of Allowance are requested.

Applicant's undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should be directed to our address listed below.

Respectfully submitted,



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Attorney for Applicant  
Steven E. Warner  
Registration No. 33,326

FITZPATRICK, CELLA, HARPER & SCINTO  
30 Rockefeller Plaza  
New York, New York 10112-3801  
Facsimile: (212) 218-2200